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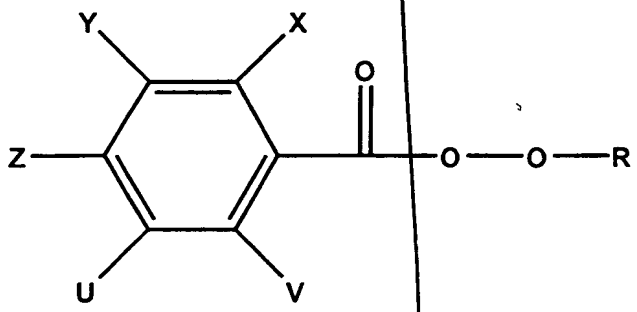
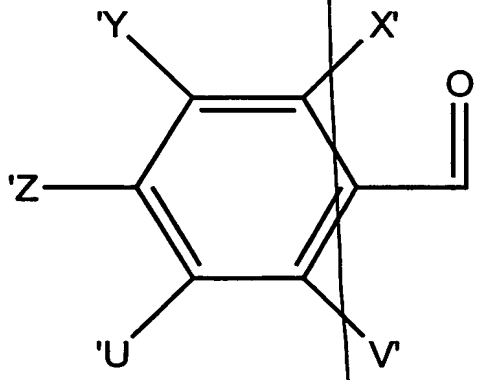
CLAIMS

1. A process for increasing the melt strength and/or the extensional melt viscosity of a polypropylene (co)polymer wherein said process comprises melt mixing the polypropylene (co)polymer in the presence of an initiator wherein said initiator is selected from the group defined by formula 1.



Formula 1

wherein R is selected from the group consisting of optionally substituted C_1 to C_{18} acyl, optionally substituted C_1 to C_{18} alkyl, aroyl defined by formula 2,



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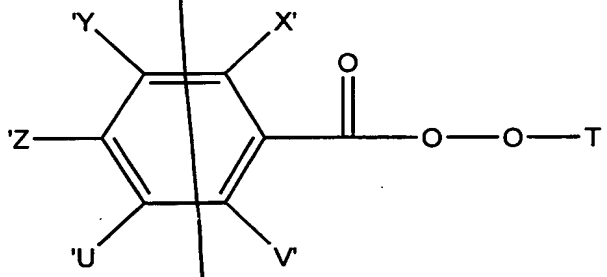
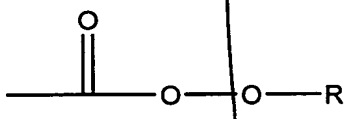
and groups of formula 3,



Formula 3

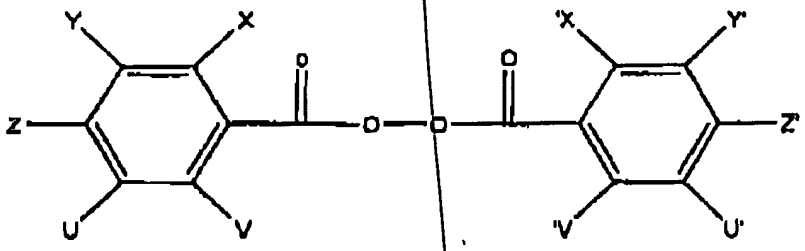
wherein U, V, X, Y, Z, U', V', X', Y' and Z' are independently selected from the group consisting hydrogen, halogen, C1-C18 alkyl, C1-C18 alkoxy, aryloxy, acyl, acyloxy, aryl, carboxy, alkoxycarbonyl, aryloxycarbonyl, trialkyl silyl, hydroxy, or a moiety of formula 4,



Formula 4

and wherein T is alkylene.

2. A process according to claim 1 wherein the initiator is selected from compounds of formula 6.



Formula 6

where X, Y, Z, U, V, X', Y', Z', U', V' are independently selected from the group consisting of hydrogen and C_1 - C_{18} alkyl where at least one of X, Y, Z, U, V and X', Y', Z', U', V' are not hydrogen.

3. A process according to claim 2 wherein the initiator is selected from the group consisting of Dibenzoyl peroxide, o,o'-Bis(methylbenzoyl) peroxide, p,p'-Bis(methylbenzoyl) peroxide, M,M'-Bis(methylbenzoyl) peroxide, o,m'-Bis(methylbenzoyl) peroxide, o,p'-Bis(methylbenzoyl) peroxide, m,p'-Bis(methylbenzoyl) peroxide, Bis(ethylbenzoyl) peroxide (all isomers), Bis(propylbenzoyl) peroxide (all isomers), Bis(butylbenzoyl) peroxide (all isomers), Bis(pentylbenzoyl) peroxide (all isomers), Bis(hexylbenzoyl) peroxide (all isomers), Bis(heptylbenzoyl) peroxide (all isomers), Bis(octylbenzoyl) peroxide (all isomers), Bis(nonylbenzoyl) peroxide (all isomers), Bis(methoxybenzoyl) peroxide (all isomers), Bis(ethoxybenzoyl) peroxide (all isomers), Bis(propoxybenzoyl) peroxide (all isomers), Bis(butoxybenzoyl) peroxide (all isomers), Bis(pentoxybenzoyl) peroxide (all isomers), Bis(hexyloxybenzoyl) peroxide (all isomers), Bis(heptyloxybenzoyl) peroxide (all isomers), Bis(octyloxybenzoyl) peroxide (all isomers), Bis(nonyloxybenzoyl) peroxide (all isomers), Bis(chlorobenzoyl) peroxide (all isomers), Bis(fluorobenzoyl) peroxide (all isomers), Bis(bromobenzoyl) peroxide (all isomers), Bis(dimethylbenzoyl) peroxide (all isomers), Bis(trimethylbenzoyl) peroxide (all isomers), Bis(tert-butylbenzoyl)peroxide (all isomers), Bis(di-

tert-butylbenzoyl)peroxide (all isomers), Bis(tertbutoxybenzoyl)peroxide (all isomers), Bis(ditrimethylsilylbenzoyl) peroxide (all isomers), Bis(heptafluoropropylbenzoyl) peroxide (all isomers), Bis(2,6-dimethyl-4- trimethylsilyl benzoyl) peroxide and isomers, 2,2'(dioxydicarbonyl) bis - Benzoic acid dibutyl ester where the term "all isomers" refers to any variation in the position of the ring substituent as well as the structure of the substituent itself i.e. for propyl; n-propyl and isopropyl.

4. A process according to claim 1 wherein the initiator is selected from the group consisting of tert-butyl perbenzoate, tert-butyl (methyl)perbenzoate (all isomers), tert-butyl (ethyl)perbenzoate (all isomers), tert-butyl (octyl)perbenzoate (all isomers), tert-butyl (nonyl)perbenzoate (all isomers), tert-amyl perbenzoate, tert-amyl (methyl)perbenzoate (all isomers), tert-amyl (ethyl)perbenzoate (all isomers), tert-amyl (octyl)perbenzoate (all isomers), tert-amyl (nonyl)perbenzoate (all isomers), tert-amyl (methoxy)perbenzoate (all isomers), tert-amyl (octyloxy)perbenzoate (all isomers), tert-amyl (nonyloxy)perbenzoate (all isomers), 2-ethylhexyl perbenzoate, 2-ethylhexyl (methyl)perbenzoate (all isomers), , 2-ethylhexyl (ethyl)perbenzoate (all isomers), 2-ethylhexyl (octyl)perbenzoate (all isomers), , 2-ethylhexyl (nonyl)perbenzoate (all isomers), 2-ethylhexyl (methoxy)perbenzoate (all isomers), 2-ethylhexyl (ethoxy)perbenzoate (all isomers), 2-ethylhexyl (octyloxy)perbenzoate (all isomers), 2-ethylhexyl (nonyloxy)perbenzoate (all isomers).

5. A process according to claim 1 wherein the initiator is selected from the group consisting of Bis (tertbutylmonoperoxy phthaloyl) diperoxy terephthalate, Bis (tertamylmonoperoxy phthaloyl) diperoxy terephthalate diacetyl phthaloyl diperoxide, dibenzoyl phthaloyl diperoxide, bis(4 methylbenzoyl) phthaloyl diperoxide, diacetyl terephthaloyl di peroxide, dibenzoyl terephthaloyl diperoxide, Poly[dioxycarbonyldioxy(1,1,4,4-tetramethyl-1,4-butanediyl)] peroxide.

6. A process according to claim 1 wherein the initiator has a 0.1 hour half life in the range 100 - 170°C.

7. A process according to claim 1 wherein the initiator is present in the range of from 0.004 to 0.25 moles of initiator per kg of the polypropylene homopolymer or copolymer.

8. A process according to claim 1 wherein the initiator is present in the range of from 0.006 to 0.10 moles of initiator per kg of the polypropylene homopolymer or copolymer.

9. A process according to claim 1 wherein the initiator is present in the range of from 0.01 to 0.05 moles of initiator per kg of the polypropylene homopolymer or copolymer.

Sub B4

10. A process according to claim 1 wherein there is no added monomer and the initiator is selected from the group consisting of Dibenzoyl peroxide, o,o'-Bis(methylbenzoyl) peroxide, p,p'-Bis(methylbenzoyl) peroxide, o,o'-Bis(methylbenzoyl) peroxide, o,m'-Bis(methylbenzoyl) peroxide, o,p'-Bis(methylbenzoyl) peroxide, m,p'-Bis(methylbenzoyl) peroxide, Bis(ethylbenzoyl) peroxide (all isomers), Bis(propylbenzoyl) peroxide (all isomers), Bis(butylbenzoyl) peroxide (all isomers), Bis(pentylbenzoyl) peroxide (all isomers), Bis(hexylbenzoyl) peroxide (all isomers), Bis(heptylbenzoyl) peroxide (all isomers), Bis(octylbenzoyl) peroxide (all isomers), Bis(nonylbenzoyl) peroxide (all isomers), Bis(methoxybenzoyl) peroxide (all isomers), Bis(ethoxybenzoyl) peroxide (all isomers), Bis(propoxybenzoyl) peroxide (all isomers), Bis(butoxybenzoyl) peroxide (all isomers), Bis(pentoxybenzoyl) peroxide (all isomers), Bis(hexyloxybenzoyl) peroxide (all isomers), Bis(heptyloxybenzoyl) peroxide (all isomers), Bis(octyloxybenzoyl) peroxide (all isomers), Bis(nonyloxybenzoyl) peroxide (all isomers), Bis(chlorobenzoyl) peroxide (all isomers), Bis(fluorobenzoyl) peroxide (all isomers), Bis(bromobenzoyl) peroxide (all isomers), Bis(dimethylbenzoyl) peroxide (all isomers), Bis(trimethylbenzoyl) peroxide (all isomers), Bis(tert-butylbenzoyl)peroxide (all isomers), Bis(di-tert-butylbenzoyl)peroxide (all isomers), Bis(tertbutoxybenzoyl)peroxide (all isomers), Bis(dimmethylsilylbenzoyl) peroxide (all isomers), Bis(heptafluoropropylbenzoyl) peroxide (all isomers), Bis(2,4-dimethyl-6- trimethylsilyl benzoyl) peroxide and isomers tert-amyl perbenzoate, tert-amyl (methyl)perbenzoate (all isomers), tert-amyl (ethyl)perbenzoate (all isomers), tert-amyl (octyl)perbenzoate (all isomers), tert-amyl (nonyl)perbenzoate (all isomers), tert-amyl (methoxy)perbenzoate (all isomers), tert-amyl (octyloxy)perbenzoate (all isomers), tert-amyl

(methoxy)perbenzoate (all isomers), tert-amyl (octyloxy)perbenzoate (all isomers), tert-amyl (nonyloxy)perbenzoate (all isomers), Bis (tertamylmonoperoxy phthaloyl) diperoxy terephthalate, diacetyl phthaloyl diperoxide, dibenzoyl phthaloyl diperoxide, bis(4-methylbenzoyl) phthaloyl diperoxide, diacetyl terephthaloyl di peroxide and dibenzoyl terephthaloyl diperoxide.

11. A process according to claim 10 wherein the initiator is more preferably the initiators are selected from the group consisting of dibenzoyl peroxide, o,o'-Bis(methylbenzoyl) peroxide, p,p'-Bis(methylbenzoyl) peroxide, M,M'-Bis(methylbenzoyl) peroxide, o,m'-Bis(methylbenzoyl) peroxide, o,p'-Bis(methylbenzoyl) peroxide, m,p'-Bis(methylbenzoyl) peroxide.

12. A process according to claim 1 wherein the initiator is used in combination with a monomer.

13. A process according to claim 12 wherein the amount of monomer is up to 5 times the total moles of initiator.

14. A process according to claim 12 or claim 13 wherein the monomer is a monoene monomer.

15. A process according to claim 12 or claim 13 wherein the monomer is styrene.

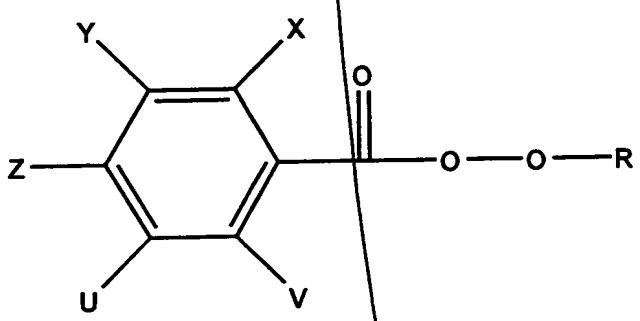
16. A process according to claim 12 wherein the initiator is selected from the group consisting of Dibenzoyl peroxide, o,o'-Bis(methylbenzoyl) peroxide, p,p'-Bis(methylbenzoyl) peroxide, M,M'-Bis(methylbenzoyl) peroxide, o,m'-Bis(methylbenzoyl) peroxide, o,p'-Bis(methylbenzoyl) peroxide, m,p'-Bis(methylbenzoyl) peroxide, Bis(ethylbenzoyl) peroxide (all isomers), Bis(propylbenzoyl) peroxide (all isomers), Bis(butylbenzoyl) peroxide (all isomers), Bis(pentylbenzoyl) peroxide (all isomers), Bis(hexylbenzoyl) peroxide (all isomers), Bis(heptylbenzoyl) peroxide (all isomers), Bis(octylbenzoyl) peroxide (all isomers), Bis(nonylbenzoyl) peroxide (all isomers), Bis(methoxybenzoyl) peroxide (all isomers),

Bis(ethoxybenzoyl) peroxide (all isomers), Bis(propoxybenzoyl) peroxide (all isomers), Bis(butoxybenzoyl) peroxide (all isomers), Bis(pentoxybenzoyl) peroxide (all isomers), Bis(hexyloxybenzoyl) peroxide (all isomers), Bis(heptyloxybenzoyl) peroxide (all isomers), Bis(octyloxybenzoyl) peroxide (all isomers), Bis(nonyloxybenzoyl) peroxide (all isomers), Bis(chlorobenzoyl) peroxide (all isomers), Bis(fluorobenzoyl) peroxide (all isomers), Bis(bromobenzoyl) peroxide (all isomers), Bis(dimethylbenzoyl) peroxide (all isomers), Bis(trimethylbenzoyl) peroxide (all isomers), Bis(tert-butylbenzoyl)peroxide (all isomers), Bis(di-tert-butylbenzoyl)peroxide (all isomers), Bis(tert-butoxybenzoyl)peroxide (all isomers), Bis(ditrimethylsilylbenzoyl) peroxide (all isomers), Bis(heptafluoropropylbenzoyl) peroxide (all isomers), Bis(2,4-dimethyl-6- trimethylsilyl benzoyl) peroxide and isomers, 2,2'(dioxydicarbonyl) bis - Benzoic acid dibutyl ester, tert-butyl perbenzoate, tert-butyl (methyl)perbenzoate (all isomers), tert-butyl (ethyl)perbenzoate (all isomers), tert-butyl (octyl)perbenzoate (all isomers), tert-butyl (nonyl)perbenzoate (all isomers), tert-amyl perbenzoate, tert-amyl (methyl)perbenzoate (all isomers), tert-amyl (ethyl)perbenzoate (all isomers), tert-amyl (octyl)perbenzoate (all isomers), tert-amyl (nonyl)perbenzoate (all isomers), tert-amyl (methoxy)perbenzoate (all isomers), tert-amyl (octyloxy)perbenzoate (all isomers), tert-amyl (nonyloxy)perbenzoate (all isomers), 2-ethylhexyl perbenzoate, 2-ethylhexyl (methyl)perbenzoate (all isomers), , 2-ethylhexyl (ethyl)perbenzoate (all isomers), 2-ethylhexyl (octyl)perbenzoate (all isomers), , 2-ethylhexyl (nonyl)perbenzoate (all isomers), 2-ethylhexyl (methoxy)perbenzoate (all isomers), 2-ethylhexyl (ethoxy)perbenzoate (all isomers), 2-ethylhexyl (octyloxy)perbenzoate (all isomers), 2-ethylhexyl (nonyloxy)perbenzoate (all isomers), Bis (tertbutylmonoperoxy phthaloyl) diperoxy terephthalate, Bis (tertamylmonoperoxy phthaloyl) diperoxy terephthalate diacetyl phthaloyl diperoxide, dibenzoyl phthaloyl diperoxide, bis(4 methylbenzoyl) phthaloyl diperoxide, diacetyl terephthaloyl di peroxide, dibenzoyl terephthaloyl diperoxide and Poly[dioxycarbonyldioxy(1,1,4,4-tetramethyl-1,4-butanediyl)] peroxide.

17. A modified polypropylene produced according to any one of the processes of claims 1, 10 and 12.

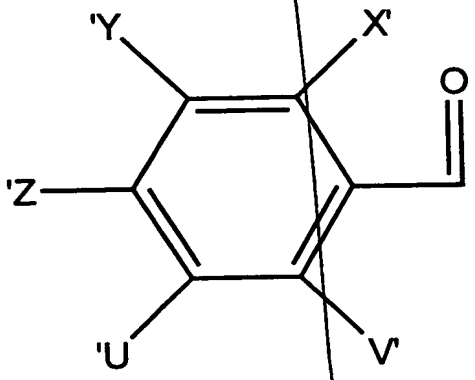
18. A process wherein the modified polypropylene of claim 17 is melt mixed with an unmodified polypropylene to produce a modified polypropylene.

19. A process for modifying an α-olefin polymer wherein said process comprises melt mixing the α-olefin polymer in the presence of an initiator and optionally a monoene monomer wherein said initiator is selected from the group defined by formula 1.



Formula 1

wherein R is selected from the group consisting of optionally substituted C_1 to C_{18} acyl, optionally substituted C_1 to C_{18} alkyl, aroyl defined by formula 2,



Formula 2

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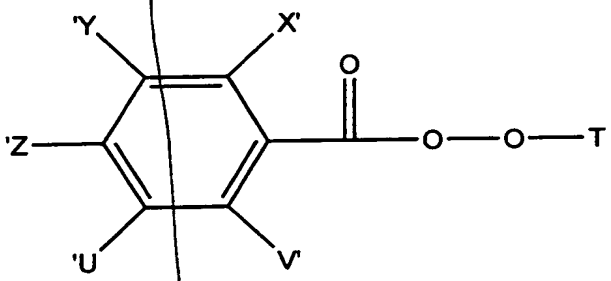
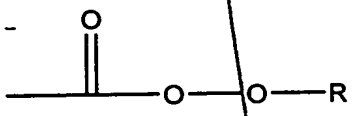
and groups of formula 3,



Formula 3

wherein U, V, X, Y, Z, U', V', X', Y' and Z' are independently selected from the group consisting hydrogen, halogen, C1-C18 alkyl, C1-C18 alkoxy, aryloxy, acyl, acyloxy, aryl, carboxy, alkoxycarbonyl, aryloxycarbonyl, trialkyl silyl, hydroxy, or a moiety of formula 4,



Formula 4

and wherein T is alkylene;

and wherein the amount of monomer is 0 to 5 times the total moles of initiator.